

UNIT

5

CONSUMER MATHEMATICS

- ▶ Taxes
- ▶ Utility Bills
- ▶ Personal Income

After completion of this unit, the students will be able to:

- ▶ Know the term tax (direct and indirect).
- ▶ Explain the following in simplest possible terms:
 - Sales tax,
 - Excise duty,
 - Property tax,
 - Income tax,
- ▶ Calculate the amount of
 - Sales tax, levied on various commodities,
 - Excise duty, levied on different items,
 - Property tax, imposed on property,
 - Income tax, imposed on an individual with fixed income,
- ▶ Calculate amount of bill for:
 - Electricity,
 - Gas,
 - Telephone.
- ▶ When previous and present meter readings are given.
- ▶ Calculate personal income (weekly, monthly and annually) of
 - A worker who is paid on daily basis.
 - A worker who is paid for overtime on hourly basis in addition to his daily wages.
 - A salesman who is paid for overtime on hourly basis and commission on different sales in addition to his regular pay.
- ▶ Calculate gross income of a salaried person who is paid on the basis of government pay scales or otherwise.
- ▶ Calculate net income taking into account assorted deductions (income tax etc).

5.1 TAXES

To finance public spending on Education, Health, National Defence etc. Government imposes various taxes, which includes direct taxes and indirect taxes on its residents.

5.1.1 Tax

Money that must be paid to the State, charged as a proportion of income and profits or added to the cost of some goods and services is called a tax.

Direct Tax

This is the tax which is charged on income, property and profits in the form of income tax, property tax etc.

Indirect Tax

Indirect tax includes duties, motor vehicle taxes, goods and services taxes, general sales tax (GST) and value added taxes etc.

5.1.2 Key Terms

Sales Tax

When we buy an article, we have to pay a certain amount of tax as the value added tax in addition to the price of an article. This tax is usually given at a certain percentage of the selling price.

In Pakistan 16% Sales tax is imposed on goods bought and services rendered.

EXAMPLE-1

A sales tax of 16% is imposed on television.

If the marked price of the television is Rs. 18000. Calculate the total amount one has to pay, if he wants to purchase it.

SOLUTION: Marked price of the television = Rs. 18000

$$\text{Sales tax payable} = \frac{16}{100} \times 18000 = \text{Rs. } 2880$$

$$\text{The total amount one has to pay} = \text{Rs. } 18000 + \text{Rs. } 2880 = \text{Rs. } 20880$$

EXAMPLE-2

A computer price is Rs. 34,800 inclusive of 16% sales tax.
What is the original price of the computer ?

SOLUTION: Computer price including tax = Rs.34,800

Let the original price = Rs.100

Then the price of computer including sales tax @16% = Rs.116

$$\begin{aligned}\text{Therefore, original price} &= \frac{100}{116} \times 34,800 = \frac{3480000}{116} \\ &= \text{Rs. } 30,000\end{aligned}$$

Excise Duty

It is the form of a tax which the buyer pays on a manufactured item at the time of purchase.

For example while purchasing cars, Motor cycles, electronic appliances, cloth etc, one has to pay Excise duty along-with the selling price.

EXAMPLE-1

A man wants to purchase a car of 1000 cc. He has to pay 150 % excise duty on price of the car. If price of the car is Rs. 5,00,000. How much amount he has to pay to purchase the car ?

SOLUTION: Price of the car = Rs.5,00,000 , Excise duty = 150%

$$\begin{aligned}\text{Amount of excise duty on Rs.5,00,000} &= \frac{150}{100} \times 5,00,000 \\ &= 150 \times 5000 = \text{Rs. } 7,50,000\end{aligned}$$

The man has to pay Rs. 7,50,000 + 5,00,000 = Rs. 12,50,000

EXAMPLE-2

The price of a television is Rs. 14040 which includes 20% excise duty. Find the amount of excise duty included in the price of the television. Also find the price of the television without duty.

SOLUTION: Price of the television including Excise duty = Rs.14040

Excise duty = 20%

Suppose the original price of television = Rs.100

Price of television including 20% Excise duty = Rs.120

$$\text{Original price of television} = 14040 \times \frac{100}{120}$$

$$= 14040 \times \frac{5}{6}$$

$$= \text{Rs.}2340 \times 5 = \text{Rs.}11700$$

Property Tax

A property tax is charged on the owner of land, houses, flats or building at a standard rate of 16%, on the annual value of the property.

EXAMPLE

The annual income of a flat is Rs. 14,00,000. Find the tax payable at a rate of 16%.

SOLUTION: Annual income of flat = 14,00,000

Rate of tax = 16%

$$\text{Tax payable} = 14,00,000 \times \frac{16}{100}$$

$$= 14,000 \times 16$$

$$= \text{Rs.}2,24,000$$

Thus tax payable is Rs. 2,24,000

Income Tax

It is the tax charged on all incomes during the financial year from 1st July to 30th of June. If the income return is filed on 30th June 2010. Then the fiscal year considered is 2009-2010 and tax year is 2009. At the end of each financial year one has to submit a return showing what was the earning during the year. The government exempts certain amount not to charge tax on it. The tax is charged on exceeding amount.

In order to work out the taxable income for salaried persons, all allowances are included in the basic pay.

EXAMPLE-1

The annual income of a person including all allowances is Rs. 3,60,000 and the exempted amount is Rs. 1,80,000. Find the income tax payable by him at the rate of Rs. 0.75%.

SOLUTION: Total annual income = Rs. 3,60,000

Exempted amount = Rs. 1,80,000

Taxable income = Rs. 3,60,000 – Rs. 1,80,000

= Rs. 1,80,000

Tax rate = 0.75 %

Thus tax payable = 1,80,000 × 0.75%

$$= 1,80,000 \times \frac{0.75}{100}$$

$$= 1,80,000 \times \frac{75}{100 \times 100}$$

$$= 18 \times 75$$

$$= \text{Rs. } 1350$$

EXAMPLE-2

The total annual income of a person is Rs. 6,28,500 and the exempted amount is Rs. 1,80,000. Calculate the net income tax payable at the rate of 3.50%. If the tax deducted at source is Rs. 15,000.

SOLUTION: Total annual income = Rs. 6,28,500

Exempted amount = Rs. 1,80,000

Taxable income = Rs. 6,28,500 – Rs. 1,80,000

= Rs. 4,48,500

Tax rate = 3.50 %

Total tax payable = Rs. 4,48,500 × Rs. 3.50%

$$= \text{Rs. } 4,48,500 \times \frac{3.50}{100}$$

$$= \text{Rs. } 4485 \times 3.50$$

$$= \text{Rs. } 15,697.50$$

Tax deducted at source = 15,000

Tax payable = Rs. 15,697.50 – Rs. 15,000

$$= \text{Rs. } 697.50$$

EXERCISE - 5.1

- 1- The price of a bicycle is Rs. 3500. If 16% sales tax is charged, then calculate the amount of sales tax on 50 such bicycles.
- 2- If the price of an air conditioner is Rs. 40,000, then work out the amount of sales tax on it at the rate of 16%. Also calculate the price of an air conditioner with sales tax.
- 3- The price of two cars of 1300 cc and 1600 cc without excise duty are 6,00,000 and Rs. 8,00,000 respectively. If the excise duty on these two are 200% and 250% respectively. Find the prices of the two cars inclusive duties.
- 4- The annual price of a house and price of land is Rs. 15,00,000 and Rs. 20,00,000 respectively. Find the property tax on each of these two at the rate of 16%.
- 5- The total taxable income of two persons is Rs. 2,50,000 and Rs. 3,10,000 respectively. Work out the income tax for each of them @ 4.5%.
- 6- The total taxable income of a person is Rs. 4,30,000. If he is given rebate Rs. 3000 on the tax chargeable, then work out the amount he has to pay as an income tax @ 4.5%.
- 7- If the total annual income of a person is Rs. 6,25,000 with exemption of amount of Rs. 1,50,000, then find the tax chargeable @ 4.5%.
- 8- The total income of a person is Rs. 5,25,000. Whereas the exemption is Rs. 1,50,000. Work out the tax payable @ 4.5% along with the income tax rate, if Rs. 10,000 has already been deducted at source as income tax.

5.2 UTILITY BILLS

In this section we are to consider utility bills relating to electricity, gas and telephone only.

Electricity Bill

Domestic electricity bills are calculated by charging every house a fixed amount. This amount consists of variation of rates in units consumed. Rates of units are below:

First 100 units @Rs. 2.65,

Second 200 units @Rs. 3.64,

Next 700 units @Rs. 6.15,

Remaining units @Rs. 7.41.

The units consumed are recorded on a device called meter. The difference between the readings at the beginning and end of a month shows how much electricity has been used; Excise Duty, PTV Fee and Income Tax are also charged in electricity bill every month.

EXAMPLE

Ahsan uses 1050 units of electricity in a month. How much does electricity cost him for a month?

SOLUTION:

Number of units consumed	= 1050
Cost of 100 units @ Rs. 2.65 is:	$100 \times 2.65 = \text{Rs. } 265$
Cost of next 200 units @ Rs. 3.64 is:	$200 \times 3.64 = \text{Rs. } 728$
Cost of next 700 units @ Rs. 6.15 is:	$700 \times 6.15 = \text{Rs. } 4305$
Cost of remaining 50 units @ Rs. 7.41 is:	$50 \times 7.41 = \text{Rs. } 370.50$
Total cost of 1050 units is	Rs. 5668.50(i)
Excise duty @ 1.5% is	Rs. 85.03(ii)
Electricity duty	Rs. 62.52(iii)
PTV fee	Rs. 25.00(iv)
Income tax @ 1.6%	Rs. 91.00(v)
Total cost (from (i) (v))	Rs. 5932.05 or Rs. 5932

Gas Bill

Many house hold use gas for cooking and heating. The amount of gas used is measured by volume and recorded by a meter in units, each of which 100 cubic feet of gas.

Gas slab rates for domestic purpose w.e.f 01-07-2009 are:

Where as $1 \text{ Hm}^3 \approx 3.30 \text{ MMBTU}$

Slab	Usage of Gas in Hm^3	Rs. Per MMBTU
1	0 to 0.50	80.65
2	over 0.50 to 1	84.45
3	over 1 to 2	153.73
4	over 2 to 3	325.48
5	over 3 to 4	423.42
6	over 4 to 5	550.44
7	5 and above	730.17

EXAMPLE

The gas meter reading shows that 4.872 Hm^3 gas was used during a month. Work out the payable amount inclusive of GST @ 16%.

SOLUTION: Gas charges 4 Hm^3 = Rs. 2201.76(i)

$.872 \text{ Hm}^3$ = Rs. 479.98(ii)

Meter rent = Rs. 120.00(iii)

Total amount (i) + (ii) + (iii) = Rs. 2801.74

GST @ 16% = $\frac{16}{100} \times 2801.74$ = Rs. 448.27

Current bill = Rs. 2801.74 + Rs. 448.27
= Rs. 3250.01
= Rs. 3250

Telephone Bills

The cost of telephone call depends upon three factors.

- (i) The distance between the caller and the person being called.
- (ii) The time of day and/or the day of the week on which the call is being made.
- (iii) The length of the call.

These three methods are put together in various ways to give metered units of time, each unit being charged at a fixed rate.

The telephone bill of a consumer according to the new rules is as under:

(i) Net PTCL dues: (included line rent, local call units charges, NWD call units charges, local mobile unit charges, NWD mobile unit charges)	Rs. 1233
(ii) Net FED (Federal excise duty @ 21%):	Rs. 259
(iii) Net W.H. Tax (withholding tax @ 4%):	Rs. 49
Total amount payable by due date:	Rs. 1540
Surcharge:	Rs. 80
Payable after due date:	Rs. 1620.00

The cellular phones bill is calculated as under:

Call charges : @ Rs. 3 per minute: (190 minutes)	Rs. 570.00
SMS charges @ Rs. 1 per SMS:	Rs. 100.00
CED (Central excise duty @ 15%)	Rs. 105.00
Total amount payable:	Rs. 775.00

EXERCISE - 5.2

- 1- In the following the gas meter reading has been given. Complete the gas bills with the help of the slabs given in the unit. Also include the meterrent and GST.

(i) 3.0756 Hm^3

(ii) 4.285 Hm^3

(iii) 2.796 Hm^3

(iv) 1.378 Hm^3

(v) 5.235 Hm^3

(vi) 4.665 Hm^3

- 2- In the following the number of units consumed while using electricity are given. Complete the Electricity bills, including the items as well as shown in the solved example of electricity bill.

(i) 315 units

(ii) 210 units

(iii) 375 units

(iv) 290 units

- 3- In the following the number of calls made are given. Complete the telephone bill including the items;

Call rate Rs. 5 per call, FED @ 15% W.H tax @ 4%.

(i) 530

(ii) 640

(iii) 750

(iv) 270

(v) 480

(vi) 315

5.3 PERSONAL INCOME

The income earned by an individual while working on daily, weekly, monthly or annually basis is called personal income of a person.

5.3.1 Personal Income of a Worker (Who is Paid on Daily Basis)

To find the personal income of a person working on daily basis, we see the following examples.

EXAMPLE-1

Calculate the gross daily wage for each of the following factory workers, if the hourly rate of pay is Rs.50 and the day is consisting of 8 hours.

	Name	Number of hours worked	Pay at the rate of Rs.50 per hours
1	Aslam	3	$3 \times 50 = \text{Rs. } 150$
2	Anwer	5	$5 \times 50 = \text{Rs. } 250$
3	Daniyal	8	$8 \times 50 = \text{Rs. } 400$
4	Abdullah	7	$7 \times 50 = \text{Rs. } 350$
5	Ali	4	$4 \times 50 = \text{Rs. } 200$
6	Hamza	6	$6 \times 50 = \text{Rs. } 300$

Daily wages along with over time

EXAMPLE-2

Daniyal works five-day a week, Monday to Friday. He starts work every-day at 8:00am and finishes at 4:00pm. He has one hour off for lunch while he works 2 hours daily as overtime. If he is paid Rs.60 per hour as regular salary and Rs.80 per hour as over time, then how many hours does he work in a month? Find his gross pay per month as well.

SOLUTION:

Number of hours from 8:00am to 4:00pm = 8 hours.

As he has one hour off for a lunch,

therefore number of hours worked each day = 7.

Number of hours worked in a week = 5×7

= 35 hours

$$\begin{aligned}\text{Number of hours works in a month} &= 4 \times 35 \\ &= 140 \text{ hours}\end{aligned}$$

$$\begin{aligned}\text{Pay for a month} &= 140 \times 60 \\ &= \text{Rs. } 8400\end{aligned}$$

He works 2 hours daily as over time,
number of hours he works as

$$\begin{aligned}\text{over time in a week} &= 2 \times 5 \\ &= 10 \text{ hours}\end{aligned}$$

Number of hours he works as over time in a month

$$\begin{aligned}&= 4 \times 10 \\ &= 40 \text{ hours}\end{aligned}$$

$$\begin{aligned}\text{Over time payment for a month} &= 40 \times 80 \\ &= \text{Rs. } 3200\end{aligned}$$

$$\begin{aligned}\text{Gross pay} &= \text{Pay} + \text{Over Time payment} \\ &= \text{Rs. } 8400 + \text{Rs. } 3200 \\ \text{Gross pay} &= \text{Rs. } 11600\end{aligned}$$

EXAMPLE-3

A sales man on a shop is paid Rs. 60 per hour along with a 5% commission on the sale price of the articles he sells. If he works on the shop from 8am to 10pm and sells articles of worth Rs. 20,000, what is his daily gross income?

SOLUTION:

$$\text{Number of hours from 8am to 10pm} = 14.$$

$$\text{Salary per hour} = \text{Rs. } 60$$

$$\text{Daily salary is} = \text{Rs. } 14 \times 60$$

$$= \text{Rs. } 840$$

$$\text{Commission} = 5\%$$

$$5\% \text{ of } 20,000 = \frac{5}{100} \times 20000$$

$$= 1000$$

$$\text{Net daily income} = \text{Salary} + \text{Commission}$$

$$= \text{Rs. } 840 + \text{Rs. } 1000$$

$$= \text{Rs. } 1840$$

5.3.2 Gross Income of a Salaried Person

Gross income of a salaried person includes basic pay, house rent, conveyance allowance, dearness allowance, medical allowance etc,

EXAMPLE

If the basic salary of a person is Rs.30,000 per month and he is paid house rent at the rate of 15% of his basic salary and 10% as dearness allowance and Rs.2000 as conveyance allowance. Further he is paid Rs. 1000 as medical allowance, then calculate his gross monthly income.

SOLUTION:

$$\text{Basic salary} = \text{Rs. } 30,000$$

$$\begin{aligned}\text{House rent} &= 15\% \text{ of basic salary} = \frac{15}{100} \times 30000 \\ &= \text{Rs. } 4500\end{aligned}$$

$$\begin{aligned}\text{Dearness allowance} &= 10\% \text{ of basic salary} = \frac{10}{100} \times 30000 \\ &= \text{Rs. } 3000\end{aligned}$$

Then monthly salary structure is:

$$\text{Basic pay} = \text{Rs. } 30,000$$

$$\text{House rent} = \text{Rs. } 4500$$

$$\text{Dearness allowance} = \text{Rs. } 3000$$

$$\text{Conveyance allowance} = \text{Rs. } 2000$$

$$\text{Medical allowance} = \text{Rs. } 1000$$

$$\text{Gross monthly income} = \text{Rs. } 40,500$$

5.3.3 Income after Deductions

The total income or take home salary of a person means the salary received after necessary deductions from the gross salary.

EXAMPLE

If the gross salary of a person is Rs. 25000, and he has to pay Rs. 360 per month as income tax, Rs. 1500 as benevolent fund and Rs. 1000 as G.P fund and Rs. 300 as group insurance, then work out his net (take home) income.

SOLUTION: Gross salary = Rs. 25,000

Deductions

Income tax = Rs. 360.....(i)

Benevolent fund = Rs. 1500.....(ii)

G.P. fund = Rs. 1000.....(iii)

Group insurance = Rs. 300.....(iv)

Total deductions = Rs. 3160 : {sum of (i), (ii), (iii), (iv)}

Net income = Gross salary - Total deductions

= Rs. 25000 - Rs. 3160

Net income = Rs. 21,840

EXERCISE - 5.3

- 1- A lady worker works a six-day week. She starts work at 7.00 am and finishes at 4pm. She has 15 minutes break in the morning and 45 minutes break in the afternoon. How long does she actually work in a week and how much she is paid, if the rate of payment is Rs.40 per hour?
- 2- Khalid works 6 day-week. Find his gross monthly wage, if his rate of pay is Rs. 200 per day.
- 3- Aslam gets paid Rs. 70 per hour for his normal working 8 hours daily (6 day week). The rate of over time is 1.5 of Rs. 70 per hour. If he works 40 hours as overtime, then work out his gross monthly pay.
- 4- Calculate the gross monthly pay of a person, if his basic pay is Rs.18000, house rent allowances is Rs.3500, dearness allowances is Rs.3000, conveyance allowance is Rs1500 and medical allowance is Rs.500.
- 5- If gross pay of a person is Rs.45,000, then calculate his net take home salary, after deductions of Rs.400 as income tax, Rs.1200 as benevolent fund, Rs.1500 as G.P. fund and Rs.400 as group insurance.
- 6- Noman works in a factory where the basic hourly rate is Rs.50 for a 35 hour week. An over time is paid at time* and - a-half. How much will he earn in a week when he works for:

(i) 38 hours(ii) 48 hours(iii) 50 hours
- 7- Abdullah's pay slip showed that he had worked 6 hours over time in addition to his basic 36 hours in a week. If his basic rate of pay is Rs.60 and over time is paid at time and a-half. Find his gross pay for the month.

*Time and-a-half stands for = 1.5 hours.

Review Exercise – 5

1- Encircle the correct answer.

(i) Money that must be paid to the state charged as proportion of income and profit added to cost of some goods and services is called a

- (a) tax (b) excise duty (c) property tax (d) income tax

(ii) The taxes which are charged on income, property and profits in the form of income tax, property tax and profits etc is called

- (a) tax (b) direct tax (c) property tax (d) income tax

(iii) Taxes of the form of duties, motor vehicle taxes are called

- (a) indirect tax (b) direct tax (c) property tax (d) income tax

(iv) The tax in addition to the price of the article is called

- (a) tax (b) sales tax (c) income tax (d) excise duty

(v) The form of a tax which a buyer pays on a manufactured item at the time of purchase is called

- (a) excise duty (b) tax (c) income tax (d) sales tax

(vi) The tax charged on the owner of a land, house flats or building is called

- (a) property tax (b) income tax (c) direct tax (d) indirect tax

(vii) The tax charged on all the taxable income is called

- (a) sales tax (b) direct tax (c) income tax (d) excise duty

2- Fill in the blanks.

(i) Money that must be paid to the state charged as a proportion of income and profits added to the cost of some goods and services is called a _____.

(ii) The taxes which are charged on income, property and profits in the form of income tax, property tax and profit etc is called a _____.

- (iii) Taxes of the form duties, motor vehicle taxes, goods and services are called _____.
- (iv) The tax in addition to the price of the article is called as _____.
- (v) The form of a tax which a buyer pay on a manufactured item at the time of purchase is called _____.
- (vi) The tax charged on the owner of a land, house, flats or building is called a _____.
- (vii) The tax charged on all taxable income is called _____.
- (viii) If the annual value of a flat is Rs.6,00,000. Then the tax payable at a rate of 15% is _____.
- (ix) The value added tax at the rate of 10% at the marked price of television of Rs.12000 is _____.
- (x) The excise duty at rate of 150%, one has to pay against an amount of Rs.3,00,000 is _____.
- 3- The price of a tricycle is Rs.4000. If 16% sales tax is charged, then calculate the amount of sales tax on 30 such tricycles.
- 4- If the total income of a person is Rs.7,00,000 with exempted amount of Rs.1,50,000. Find the tax chargeable @ 4.5%.
- 5- The gas meter shows that 5.670 Hm^3 gas was used during a month period. Work out the payable amount inclusive of GST @ 16%.
- 6- The number of units consumed while using electricity are as under.
(i) 275 units (ii) 200 units (iii) 340 units (iv) 285 units.
Complete the electricity bills, including the items as well as shown in the solved example of electricity bill.
- 7- The gross monthly pay of a person is Rs.75,000. If Rs.1500, Rs.1200 and Rs.1800 are deducted as income tax, benevolent fund and G.P fund respectively, then calculate the net take home salary of the person.

SUMMARY

- ✦ Money that must be paid to the state, charged as a proportion of income and profits are added to the cost of some goods and services is called tax.
- ✦ Direct tax is charged on income, property and profits in the form of income tax, property tax and profit tax etc.
- ✦ Indirect taxes include duties, motor vehicle taxes, goods and services taxes, (GST) general sale tax and value added taxes etc.
- ✦ When we buy article we have to pay a certain amount of tax as the value added tax in addition to the price of the article is called sales tax. This tax usually given as a certain percentage of the selling price. In Pakistan sales tax of 16% is imposed on goods bought and services rendered.
- ✦ Excise duty is the form of a tax which the buyer pay on a manufactured item at the time of purchase.
- ✦ A property tax is charged on the owner of land, house, flats or building at a standard rate of 16% on the annual value of the property.
- ✦ Income tax charged on all taxable incomes during the year from 1st July to next 30th June.